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First record of the engraulid fish *Encrasicholina macrocephala* (Clupeiformes) from Somalia

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Abstract
A single specimen of *Encrasicholina macrocephala* Hata & Motomura, 2015 (58.7 mm in standard length), collected in Somalia in 1986, is the first record of the species from Somalian waters. This species is otherwise known only from the type specimens, collected in Djibouti and Oman.

Key words
Range extension; Engraulidae; Teleostei; fish fauna; morphology; new record.

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Introduction

The engraulid fish genus *Encrasicholina* Fowler, 1938 is characterized by a short isthmus muscle not reaching anteriorly to the posterior margin of the gill membrane, an exposed urohyal, prepelvic scutes and the absence of postpelvic scutes (Whitehead et al. 1988, Wongratana et al. 1999). The genus contains 9 valid species (Whitehead et al. 1988, Hata and Motomura 2015, Hata and Motomura 2016a, Hata and Motomura 2016b, Hata and Motomura 2017), including *E. macrocephala* Hata and Motomura, 2015, currently known only from the type specimens, collected from Djibouti and Oman (Hata and Motomura 2015). During a revisionary study of *Encrasicholina*, a single engraulid specimen from Somalia was identified as *E. macrocephala*. That species is distinguished from its congeners by having a long upper jaw, the posterior tip of which extends beyond the posterior margin of the preopercle, in addition to three unbranched fin rays in the dorsal and anal fins, and a large head (29.5–31.7% of standard length; Hata and Motomura 2015). The present specimen, described here in detail, represents the first record of the species from Somalia.

Methods

Counts and proportional measurements follow Hata and Motomura (2015). All measurements were made with digital calipers to the nearest 0.1 mm. Standard and head lengths were abbreviated as SL and HL respectively. The specimen of *E. macrocephala* from Somalia is deposited at the Museum Support Center of the National Museum of Natural History, Smithsonian Institution, Suitland, MD (USNM). Comparative specimens were listed in Hata and Motomura (2015). Collection sites of *E. macrocephala* are shown in Figure 1.

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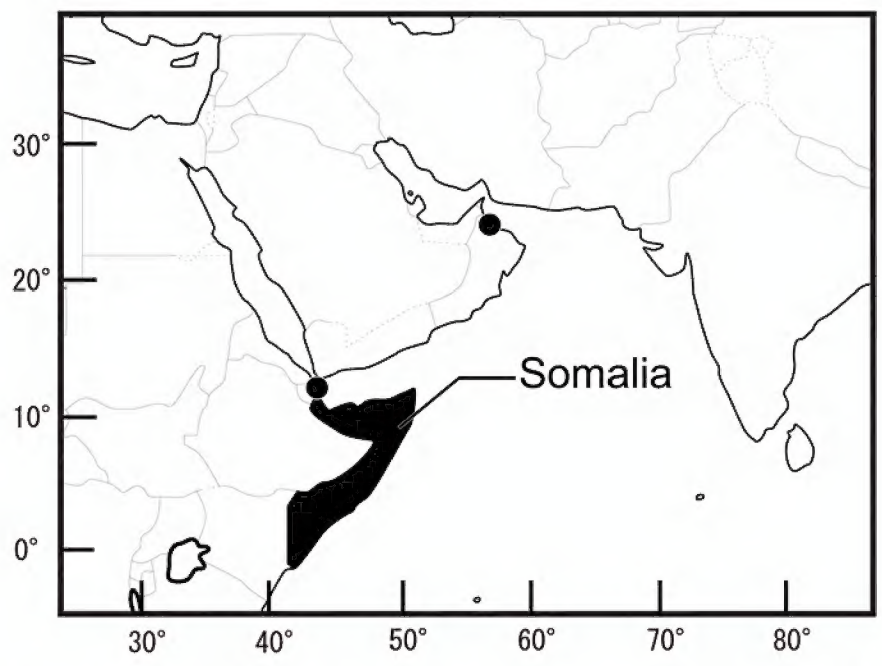

Figure 1. Previous and new records (Somalia) for *Encrasicholina macrocephala*. Circles indicate previous records.

Results

Examined material. USNM 306070, 58.7 mm SL, Somalia, 10 February 1986, G. J. Small (Fig. 2; Tables 1, 2).

Description. Unbranched dorsal-fin rays 3. Branched dorsal-fin rays 10. Unbranched anal-fin rays 3. Branched anal-fin rays 14. Unbranched pectoral-fin rays 1. Branched pectoral-fin rays 12. Unbranched pelvic-fin rays 1. Branched pelvic-fin rays 6. Caudal-fin rays 19. Gill rakers on 1st gill arch 18 + 22. Gill rakers on 2nd gill arch 15 + 22. Gill rakers on 3rd gill arch 12 + 12. Gill rakers on 4th gill arch 10 + 10. Gill rakers on posterior face of 3rd gill arch 8. Prepelvic scutes 5. Lateral-line scales 39. Pseudobranchial filaments 18. The following morphometrics are expressed as percentage of SL: head length 29.5; body depth 16.4; pre-dorsal-fin length 54.6; length from snout tip to pectoral-fin insertion 30.3; length from snout tip to pelvic-fin insertion 43.4; length from snout tip to anal-fin origin 65.6; dorsal-fin base length 12.3; anal-fin base length 16.0; caudal-peduncle length 19.9; caudal-peduncle depth 7.6; pectoral-fin length 15.1; pelvic-fin length 9.4; interorbital width 5.7; upper-jaw length 22.3; mandibular length 20.0; length from supramaxilla end to maxilla end 1.9; 1st unbranched dorsal-fin ray length 1.4; 2nd unbranched dorsal-fin ray length 6.3; 1st unbranched anal-fin ray length 1.2; 1st pectoral-fin ray length 15.1; 1st pelvic-fin ray length 9.4. The following morphometrics are expressed as percentage of HL: orbit diameter 27.7; eye diameter 20.6; snout length 17.7; D–P1 (distance from dorsal-fin origin to pectoral-fin insertion) 94.4; D–P2 (distance from dorsal-fin origin to pelvic-fin insertion) 60.5; D–A (distance from dorsal-fin origin to anal-fin origin) 69.4; P1–P2 (distance from pectoral-fin insertion to pelvic-fin insertion) 61.5; P2–A (distance from pelvic-fin insertion to anal-fin origin) 57.6; postorbital length 52.9; width of ventral urohyal 4.3.

Table 1. Meristics of specimens of *Encrasicholina macrocephala*.

	This study	Hata and Motomura (2015)	
	Nontype Somalia USNM 306070	**Holotype Djibouti MNHN 2014-0152**	**Paratypes Djibouti and Oman *n* = 16**
Standard length (SL; mm)	58.7	44.6	42.3–55.7
Counts			
Dorsal-fin rays (unbranched)	3	3	3
Dorsal-fin rays (branched)	10	11	10–11
Anal-fin rays (unbranched)	3	3	3
Anal-fin rays (branched)	14	15	14–16
Pectoral-fin rays (unbranched)	1	1	1
Pectoral-fin rays (branched)	12	11	10–13
Pelvic-fin rays (unbranched)	1	1	1
Pelvic-fin rays (branched)	6	6	6
Caudal-fin rays (upper + lower)	19	19	19
Gill rakers on 1st gill arch (upper)	18	19	17–20
Gill rakers on 1st gill arch (lower)	22	23	21–25
Gill rakers on 1st gill arch (total)	40	42	40–45
Gill rakers on 2nd gill arch (upper)	15	15	13–17
Gill rakers on 2nd gill arch (lower)	22	21	20–22
Gill rakers on 2nd gill arch (total)	37	36	33–38
Gill rakers on 3rd gill arch (upper)	12	12	11–13
Gill rakers on 3rd gill arch (lower)	12	13	11–13
Gill rakers on 3rd gill arch (total)	24	25	22–26
Gill rakers on 4th gill arch (upper)	10	10	9–12
Gill rakers on 4th gill arch (lower)	10	10	9–11
Gill rakers on 4th gill arch (total)	20	20	18–23
Gill rakers on posterior face of 3rd gill arch	8	6	5–8
Prepelvic scutes	5	5	5–6
Lateral-line scales	39	39	39–41
Pseudobranch filaments	18	16	15–18

Figure 2. *Encrasicholina macrocephala*, USNM 306070, 58.7 mm SL; Somalia (preserved).

Table 2. Morphometric of specimens of *Encrasicholina macrocephala*.

	This study	Hata and Motomura (2015)	
	Non-type Somalia	Holotype Djibouti	Paratypes Djibouti and Oman
	USNM 306070	MNHN 2014-0152	*n* = 16
Standard length (SL; mm)	58.7	44.6	42.3–55.7
Measurements (% of SL)			
Head Length	29.5	31.3	29.5–31.7
Body depth	16.4	16.4	14.0–16.4
Predorsal length	54.6	54.9	51.1–55.5
Snout tip to pectoral-fin insertion	30.3	31.5	30.2–32.6
Snout tip to pelvic-fin insertion	43.4	49.6	45.8–51.3
Snout to anal-fin origin	65.6	66.9	64.5–70.9
Length of dorsal-fin base	12.3	11.8	10.7–12.7
Length of anal-fin base	16.0	17.0	13.9–17.2
Length of caudal peduncle	19.9	17.4	16.9–20.1
Depth of caudal peduncle	7.6	7.9	7.6–8.7
Pectoral-fin length	15.1	broken	14.8–16.2
Pelvic-fin length	9.4	9.2	8.5–10.4
Interorbital width	5.7	6.0	5.8–6.5
Upper-jaw length	22.3	21.3	21.6–23.5
Mandibular length	20.0	19.8	19.5–21.2
Supramaxilla end to maxilla end	1.9	1.3	1.7–2.6
1st unbranched dorsal-fin ray	1.4	1.0	0.6–1.3
2nd unbranched dorsal-fin ray	6.3	broken	4.6–7.3
3rd unbranched dorsal-fin ray	broken	broken	14.4–18.2
1st unbranched anal-fin ray	1.2	1.0	0.5–1.0
2nd unbranched anal-fin ray	broken	broken	3.0–4.5
3rd unbranched anal-fin ray	broken	broken	9.8–12.1
1st pectoral-fin ray	15.1	broken	15.2–16.2
1st pelvic-fin ray	9.4	broken	8.1–10.4
Measurements (% of HL)			
Length of orbit	27.7	28.9	26.9–31.9
Length of eye	20.6	21.9	21.9–25.3
Snout length	17.7	18.0	16.8–18.5
D–P1	94.4	86.3	83.2–95.2
D–P2	60.5	53.6	48.0–55.2
D–A	69.4	62.9	59.3–71.8
P1–P2	61.5	52.5	51.4–70.1
P2–A	57.6	57.2	53.6–62.6
Postorbital length of the head	52.9	51.4	51.1–55.6
Width of urohyal	4.3	1.5	1.0–4.8

Body cylindrical, elongate, deepest at dorsal-fin origin. Dorsal profile of head and body slightly convex from snout tip to dorsal-fin origin, straight along dorsal-fin base. Ventral profile of head and body slightly convex from lower-jaw tip to pelvic-fin insertion, slightly convex to straight from pelvic-fin origin to anal-fin origin,

and almost straight along anal-fin base. Dorsal and ventral profiles of caudal peduncle slightly concave. Belly slightly rounded, covered by 5 sharp needle-like scutes anterior to insertion of pelvic fins. Postpelvic and predorsal scutes absent. Anus situated just anterior to anal-fin base. Caudal peduncle compressed; its depth greater than eye diameter. Head large, compressed. Snout tip rounded; snout length less than orbit diameter. Interorbital width less than orbit diameter. Mouth inferior, ventral to body axis; large, extending backward beyond posterior margin of eye. Lower jaw slender, shorter than upper jaw, 93.0% (89.4–94.9%) of upper-jaw length. Posterior tip of maxilla pointed, projecting beyond second supra-maxilla and reaching to interopercular margin. Single row of conical teeth on each jaw and on palatines. Small conical teeth on vomer. Eye lateral on head, located dorsal to horizontal through pectoral-fin insertion; eye large, covered with adipose eyelid; visible in dorsal and ventral views. Eye and pupil round. Orbit elliptical. Nostrils close to each other, positioned anterior to orbit. Posterior margin of preopercle smooth. Subopercle with rounded posterior margin. Opercular membrane without serrations. Interorbital space flat. Pseudobranchial filaments present; length of longest filament less than eye diameter. Posterior frontal fontanelles on top of head near occiput open. Gill rakers long and slender, rough; visible from side of head when mouth opened. Distance between pectoral-fin and pelvic-fin insertions subequal to distance between pelvic-fin insertion and anal-fin origin. Isthmus muscle short, not reaching anteriorly to posterior border of gill membrane, preceded by exposed urohyal between gill membranes. Gill membrane not broadly joined over isthmus. No scales on head. Lateral line absent. No scales on fins except for broad triangular sheath on caudal fin. Dorsal-fin origin posterior to vertical through base of last pelvic-fin ray, slightly posterior to middle of body. Dorsal-fin base short, its length 76.9% of anal-fin base length. Dorsal and anal fins with three anteriormost rays unbranched. First dorsal-fin ray and first anal-fin ray minute. Three anteriormost dorsal-fin rays and three anteriormost anal-fin rays closely spaced. Posterior tip of depressed dorsal fin reaching to vertical through anal-fin origin. Anal-fin origin posterior to vertical through base of last dorsal-fin ray. Posterior tip of depressed anal fin not reaching to caudal-fin base. Caudal fin forked. Uppermost pectoral-fin ray unbranched, inserted below midline of body. Posterior tip of pectoral fin not reaching to vertical through pelvic-fin origin. Pelvic fin shorter than pectoral fin; pelvic-fin insertion anterior to vertical at dorsal-fin origin. Posterior tip of depressed pelvic fin reaching vertical through base of 8th dorsal-fin ray, not reaching to anus.

Color of preserved specimen. Head and body almost uniformly pale brown.

Remarks. The Somalian specimen was identified as *E. macrocephala* on the basis of the following combination of characters, which closely matched the diagnostic features given by Hata and Motomura (2015): dorsal and anal fins with three unbranched rays; total pectoral-fin rays 13; pseudobranchial filaments 18; gill rakers 18 in upper series on 1st gill arch, 22 in lower series, 40 in total; gill rakers 15 in upper series on 2nd gill arch, 22 in lower series, 37 in total; gill rakers 12 in upper series on 3rd gill arch, 12 in lower series, 24 in total; gill rakers 10 in upper series on 4th gill arch, 10 in lower, 20 in total; prepelvic scutes 5; head large, length 29.5% of SL; upper jaw long, length 22.3% of SL, posterior tip reaching to interopercular margin; lower jaw long, length 20.0% of SL; D–P1 short, 94.4% of HL.

In addition, the meristics and morphometrics of the present specimen greatly agree with those of *E. macrocephala* given by Hata and Motomura (2015) (Tables 1, 2). Nine species are attributed to the genus *Encrasicholina* (Hata and Motomura 2015, 2016a, 2016b, 2017). *Encrasicholina macrocephala* can be distinguished from *E. gloria* Hata & Motomura, 2016, *E. intermedia* Hata & Motomura, 2016, *E. oligobranchus* (Wongratana, 1983), *E. punctifer* Fowler, 1938, and *E. purpurea* (Fowler, 1900) by its long upper jaw, with posterior tip extending beyond the posterior margin of the preopercle (vs. posterior tip of upper jaw not reaching to posterior margin of preopercle in the other 5 species; Whitehead et al. 1988, Wongratana et al. 1999; Hata and Motomura 2015, Hata and Motomura 2016b). *Encrasicholina macrocephala* differs from *E. pseudoheteroloba* in having the dorsal and anal fins with 3 unbranched rays (vs. 2 unbranched rays). This species resembles *E. heteroloba* (Rüppell 1837) and *E. auster* Hata & Motomura, 2017 in having its long upper jaw, with posterior tip reaching to or extending beyond the posterior margin of the preopercular margin, and the dorsal and anal fins with 3 unbranched rays. *Encrasicholina macrocephala* can be distinguished from the latter 2 species in having a longer head (29.5%–31.7% vs. 24.9–28.9% in *E. heteroloba* and 29.1–29.2% in *E. auster*). Detailed comparisons among the 3 species were given in Hata and Motomura (2015, *E. heteroloba* was treated as *E. devisi*; 2017).

Discussion

Encrasicholina macrocephala has been recorded only from Djibouti and the Batina Coast, Oman (Hata and Motomura 2015). The present specimen represents the first record of the species from Somalian waters and suggests that it is widely distributed in the northwestern Indian Ocean.

Distributional range of a related species, *Encrasicholina gloria* partly overlaps with that of *E. macrocephala* (Hata and Motomura 2016a). *Encrasicholina intermedia* Hata & Motomura, 2016, the probable sister species of *E. gloria*, is distributed off the eastern coast of Africa and the western coast of India, but with these species not occurring sympatrically (Hata and Motomura 2016a). In addition, several clupeiform species in the northern Indian Ocean, such as *Herklotsichthys lossei* Wongratana,

1983, known only from the Persian Gulf, *H. punctatus* from the Red Sea, and *Nematalosa arabica* Regan, 1917 from the Gulf of Aden to Oman Bay, do not occur along the east coast of Africa (Whitehead 1985). Judging from the distributional patterns of the above-mentioned species, *E. macrocephala* is not likely to occur southward from Kenya along the east coast of Africa. In addition, since *E. gloria* and *H. punctatus* have been reported from the Mediterranean Sea following Lessepsian migration (Whitehead 1985, Hata and Motomura 2016a), *E. macrocephala*, which is expected to occur in the Red Sea, may also be collected in the Mediterranean Sea in the future. Because *E. macrocephala* was recently described as a new (Hata and Motomura 2015), information on its biology and distribution is limited; additional specimens and data for this species are required.

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Authors' Contributions

HH collected the data and made the analysis, HH and HM wrote the text.

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